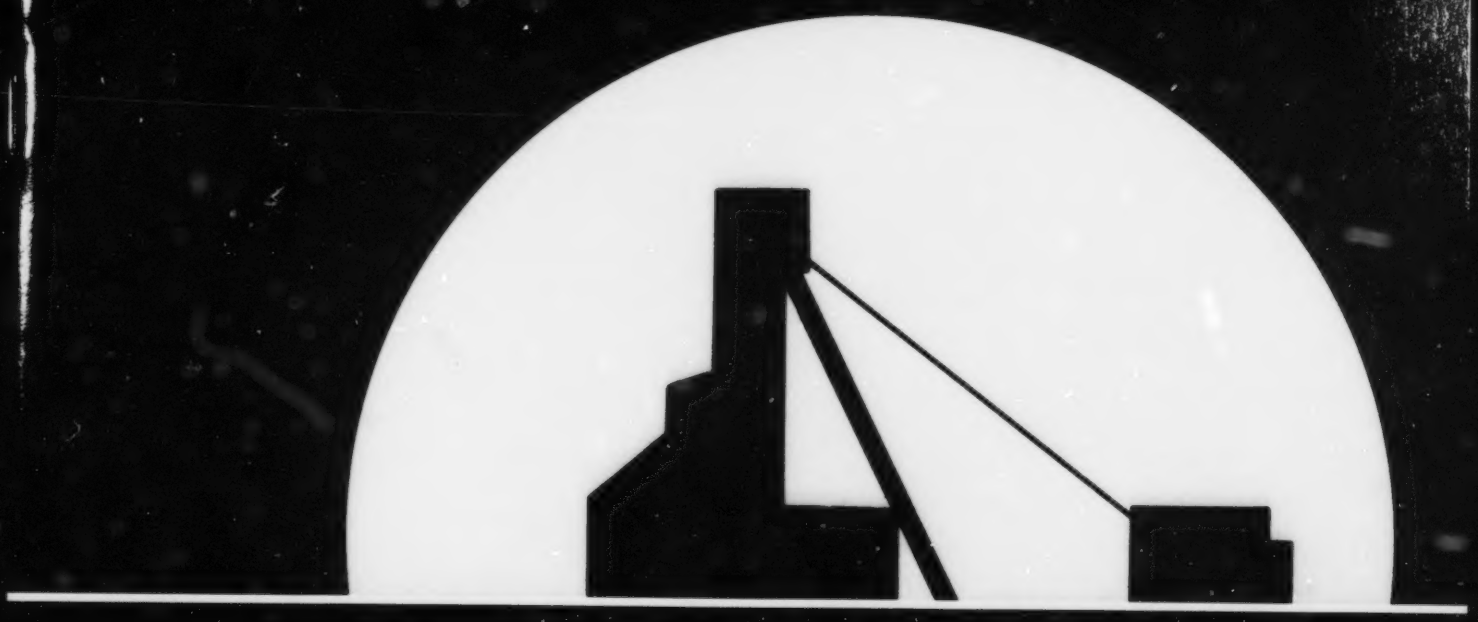
Mines and Mineral Activities 1991



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Mines and Mineral Activities 1991

Northern Affairs Program

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INTRODUCTION

This report covers the activities of the mines and minerals sector of Yukon and the Northwest Territories during the calendar year 1991.

The report was compiled by D.D.Brown of the Mining and Infrastructure Directorate of the Department of Indian Affairs and Northern Development (DIAND), Ottawa. Sections on mineral exploration are based on the 1991 mining exploration overviews produced by DIAND regional staff under the direction of S.R.Morison, Northern Affairs Program in Yukon Region and W.A. Padgham, Northern Affairs Program in the Northwest Territories Region.

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SUMMARY

Yukon

The value of minerals produced in Yukon was estimated at $346 million in 1991 compared with $542 million in 1990. Curragh Resources' Faro zinc-lead-silver operation was the largest producer. In August 1991, Curragh Resources Inc. and Hillsborough Resources Inc. started up the new Sa Dena Hes zinc-lead mine. The decline in Yukon's mineral production value during 1991 was caused by lower zinc and lead prices and reduced production at the Faro operation during a 10-week strike. Lead and zinc from the Faro and Sa Dena Hes hardrock operations accounted for 75 per cent of the total value of mineral production. The number of placer gold operations remained about the same in 1991 as in 1990, but production reported by royalty payments dropped by 19 per cent. The preliminary value of sold gold represents 19.4 per cent of the total value of mineral production. Although no hardrock gold mines were in production during 1991, Wheaton River Minerals Ltd. could bring its Skukum Creek gold property in the Wheaton River area into production in 1992. The property includes the Mount Skukum mine and mill, a recent gold producer.

At year end 1991, Curragh Resources was ready to begin a $40 million preproduction stripping program on the Grum zinc-lead-silver deposit near Faro, but work was delayed pending the financing of the project. The development of the Grum deposit is essential for the continuance of Curragh's Faro mill operation during the 1990s.

In 1991, exploration expenditures in Yukon rose to $16 million from about $12 million a year earlier. Seven major companies accounted for three quarters of the expenditures. The exploration work was directed to zinc-lead-silver, gold and copper properties.

Northwest Territories

The value of minerals produced in the Northwest Territories was estimated at $545 million in 1991 compared with $730 million in 1990. The decline was due to lower metal prices. Mineral production was derived from five gold mines and two zinc-lead mines, with gold accounting for 40.5 per cent of the mineral production value and zinc-lead for 56.1 per cent.

Production of Northwest Gold Corp.'s Colomac gold mine was suspended in June 1991 pending an improvement in gold prices and financial restructuring. The NERCO Con mine and Echo Bay's Lupin mine set gold production records in 1991. Cominco's Polaris mine and the Nanisivik mine, both in the Arctic, continued to perform well despite low metal prices.

In 1991, exploration expenditures in the Northwest Territories increased marginally over the $36 million spent in 1990. Major mining companies were responsible for most of the exploration expenditures, and gold, base metals, uranium and diamonds were the principal targets. Claim staking continued at low levels through to October 1991. In November 1991, BHP-Utah Mines and Dia Met Minerals announced a diamond-bearing drill intersection in kimberlite on their property at Lac de Gras, in the Exeter Lake area, northeast of Yellowknife. The release of this information caused a staking rush, and intensive exploration activity for diamondiferous kimberlite is expected in the region in 1992.

SOMMAIRE

Yukon

La valeur des minéraux extraits au Yukon a été évaluée à 346 millions de dollars en 1991, comparativement à 542 millions de dollars en 1990. L'exploitation de zinc, de plomb et d'argent à la mine Faro de la Curragh Resources s'est classée au premier rang de la production. En août 1991, les sociétés Curragh Resources Inc. et Hillsborough Resources Inc. ont ouvert la nouvelle mine de zinc et de plomb de Sa Dena Hes. Le déclin de la valeur de la production minérale du Yukon en 1991 est attribuable à une baisse du prix du zinc et du plomb et une activité réduite à la mine Faro due à une grève de dix semaines. Le plomb et le zinc extraits des mines en roche dure à Faro et à Sa Dena Hes représentent 75 p. 100 de la valeur totale de la production minérale. Le nombre de placers a peu changé en 1991 par rapport à 1990, mais la production déclarée aux fins du paiement des redevances a baissé de 19 p. 100. La valeur préliminaire de l'or représente 19,4p.100 de la valeur totale de la production minière. Bien qu'aucune mine en roche dure n'ait été en activité en 1991, la Wheaton River Minerals Ltd pourrait commencer l'exploitation de sa propriété du Skukum Creek, dans la région de la Wheaton River, en 1992. Cette propriété comprend la mine du mont Skukum, nouvelle exploitation aurifère.

À la fin de 1991, la Curragh Resources était sur le point de mettre en oeuvre un programme d'enlèvement des morts-terrains, d'une valeur de 40 millions, dans son gisement de zinc, de plomb et d'argent de Grum, près de Faro, mais les travaux ont été reportés pour permettre le financement du projet. La mise en valeur du gisement de Grum est essentielle à l'exploitation continue de la mine de Faro de la Curragh dans les années 1990.

Au Yukon, les dépenses liées à la prospection s'ont passées de 12 millions de dollars en 1990 à 16 millions de dollars en 1991. Sept grandes sociétés se partagent les trois quarts des dépenses. Les travaux de prospection ont été orientés vers les propriétés de zinc, de plomb et d'argent, les propriétés d'or et le cuivre.

Territoires du Nord-Ouest

La valeur des minéraux extraits dans les Territoires du Nord-Ouest a atteint 545 millions de dollars en 1991, comparativement à 730 millions de dollars en 1990. La baisse du prix des métaux explique le fléchissement de la valeur en 1991. La production minérale provenait de cinq mines d'or et de deux mines de zinc et de plomb; la production de l'or représentait 40,5 p. 100 de la valeur totale de la production minérale et celle de plomb et de zinc, 56,1 p. 100.

Les travaux de la mine d'or de Colomac de la Northwest Gold Corporation ont été interrompus en juin1991, en prévision d'une majoration du prix de l'or et d'une restructuration financière.
La mine Con de la Nerco et la mine Lupin de l'Echo Bay ont atteint une production record en 1991. La mine Polaris de la Cominco et la mine Nanisivik, toutes deux situées dans l'Arctique, ont continué d'exceller malgré la baisse du prix des métaux.

En 1991, dans les Territoires du Nord-Ouest, les dépenses de prospection ont légèrement dépassé les 38 millions de dollars dépensés en 1990. La majorité des dépenses de prospection ont été engagées par les grandes sociétés minières, principalement pour la production de l'or, des métaux communs, de l'uranium et des diamants. Le jalonnement des concessions s'est poursuivi à petite échelle jusqu'au mois d'octobre 1991. En novembre 1991, la BHP-Utah Mines et la Dia Met Minerals ont annoncé un recoupement diamantifère dans la kimberlite de leur propriété au Lac de Gras, dans la région d' Exeter Lake, au nord-est de Yellowknife. Cette annonce a provoqué une ruée de jalonnement et des travaux importants de prospection de la kimberlite diamantifère sont prévus dans la région en 1992.

MINES AND MINERALS ACTIVITIES 1991

Yukon

Mineral Production

The value of mineral production in Yukon during 1991 was estimated at $346.2 million compared with $541.8 million the previous year. The lower production value in 1991 was caused principally by depressed zinc and lead prices during the year and lower concentrate production at Curragh ResourcesInc.'s Faro operation. The operation was affected by a 10-week strike in the second quarter of 1991. Curragh Resources Inc. and Hillsborough Resources Ltd. began production at the new Sa Dena Hes zinc-lead mine on August 1, 1991. Production of concentrate during the remainder of the year contributed to Curragh's total output.

Gold production from Yukon's placer mine operations continued to be second in value only to zinc-lead output from the Faro and Sa Dena Hes operations. Placer gold production reported by royalty payments in 1991 declined by approximately 19 per cent from the previous year to reach 3482.7 kg of crude gold.

Among a number of prospective properties, Loki Gold Corporation and Hemlo Gold Mines Inc. continued extensive drilling on the Brewery Creek property, near Dawson, where shallow oxidized gold reserves show good recoveries for heap leach processing. Wheaton River Minerals Ltd. acquired the developed Skukum Creek gold deposit, south of Whitehorse and the nearby Mount Skukum mine. The company could begin production as early as September 1992. Western Copper Holdings and Thermal Exploration have defined a large tonnage of oxidized copper reserves, which could be mined by open pit and be processed by heap-leach and solvent extraction methods.

Yukon's hardrock mine operations, comprising Curragh Resources' Faro and Vangorda mines and its Sa Dena Hes mine, owned jointly with Hillsborough Resources, directly employed 510 mine workers at year end 1991. Yukon's 194 placer mining operations employed an estimated 700 people during the placer mining season.

Yukon accounted for 13.2 per cent of the zinc, 39.8 per cent of the lead and 2.8 per cent of the gold produced in Canada during 1991. Yukon's 1991 metallic mineral production value amounted to 3.25 per cent of the total value of Canada's 1991 metallic mineral production. This compares with 4.25 per cent in 1990.

Mines

Curragh Resources Inc., Faro and Vangorda Mines

Curragh Resources is the leading mine operator in Yukon. In 1991, the Faro mill (a)* processed 4.1million tonnes (t) of ore to yield 287 015 t of zinc concentrate and 155 765 t of lead concentrate. This compares with 359 444 t of zinc concentrate and 189 040 t of lead concentrate during the previous year. Lower concentrate production in 1991 compared with 1990 was attributed to a 10-week strike in the second quarter of 1991 and a small drop in mill feed grade. By the fourth quarter of 1991, approximately 50 per cent of the ore processed came from the Vangorda pit and 50 per cent from the Faro pit. In July and August 1991, heavy rainfall threatened the stability of the Faro pit wall and mine operations were temporarily suspended to ensure employee safety.

In 1991, soft metal prices and the high Canadian dollar squeezed the economics of the Faro operation severely. A cutback of almost 20 per cent of the work force took place.

In 1992, the Faro deposit will be depleted. However, the Vangorda pit is expected to produce 2.9 million t of ore to account for two thirds of the mill feed to the Faro concentrator. Over the next decade the Grum deposit, located between the Faro and Vangorda deposits, is expected to be the most important source of feed to the Faro mill. Preproduction stripping of the Grum deposit is required at a rate of 74 000 tonnes per day (tpd) for approximately 10 months to bring this new mine into production. At year end 1991, work was delayed pending the availability of full financing.

Type:	underground and open pit at Faro, open pit at Vangorda
Location:	14 km north of Faro and 7 km east-northeast of Faro
Product:	zinc, lead, silver, gold
Mill Capacity:	13 500 tpd
Tonnes Milled:	4.1 million t
Ore Reserves:	N/A
Ore Reserve Grade:	N/A
Employees:	422 (December 31, 1991)

N/A: Not available

* Numbers or letters in parenthesis indicate the location of the property on Map. 1

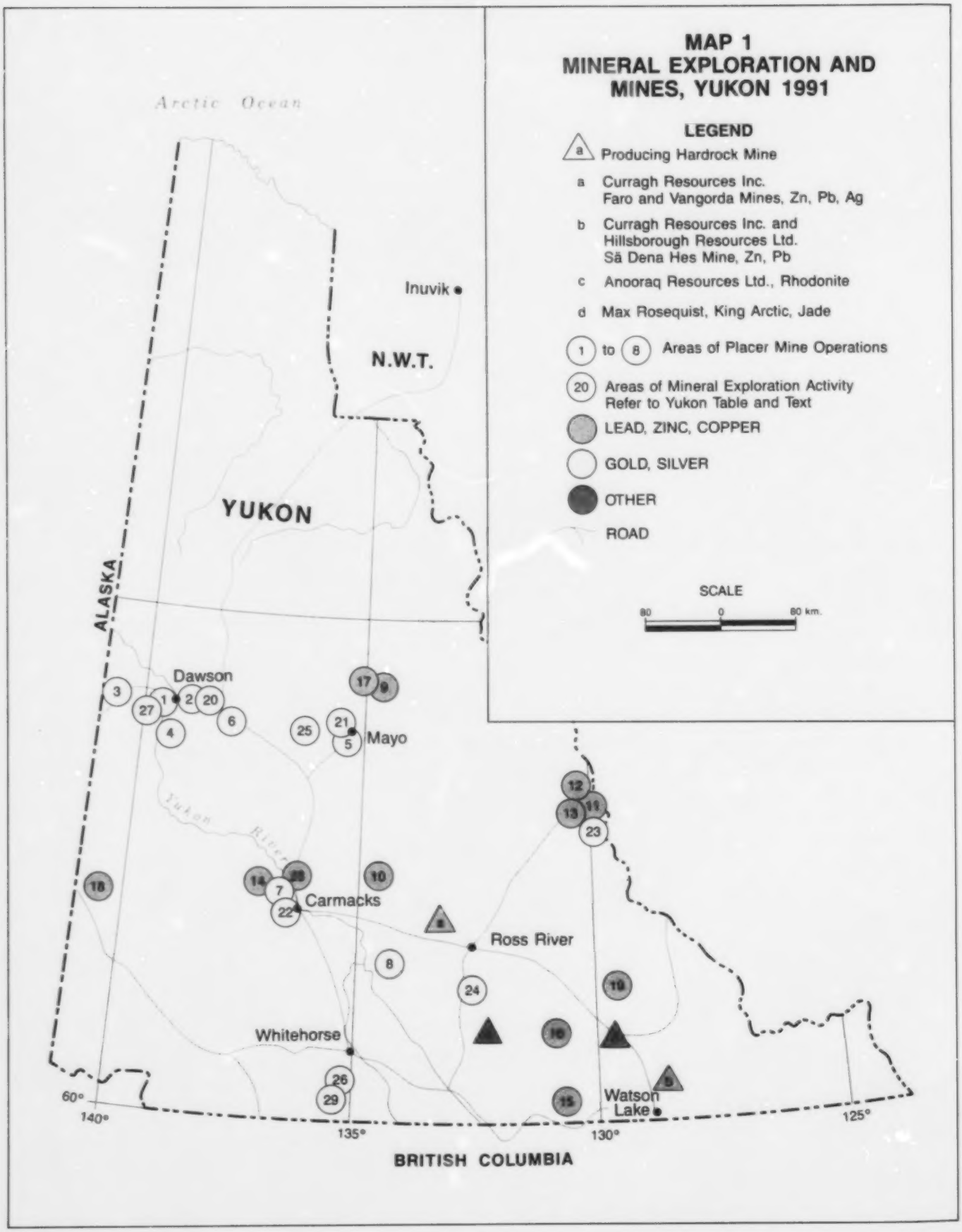
Table 1:
Mineral Production of Operating Mines, Yukon, 1989, 1990 and 1991

Company, Mine and Commodity	1989 t	1989 kg	1990 t	1990 kg	1991(P) t	1991(P) kg
Curragh Resources Inc.						
Faro and Vangorda mines						
zinc	176 832		151 910		135 442*	
lead	108 144		105 510		101 831*	
silver		95 428		86 343		N/A
Curragh Resources Inc. and Hillsborough Resources Ltd.						
Sa Dena Hes mine						
zinc						
lead						

* Sa Dena Hes mine's zinc and lead production is included in figures for Faro and Vangorda mines above

Source: Department of Indian Affairs and Northern Development. These figures are those reported by the mines as production and will not match Statistics Canada's production figures which are based on metals sold or shipped.

(P) = Preliminary N/A = Not Available


MAP 1
MINERAL EXPLORATION AND MINES, YUKON 1991
LEGEND
a Producing Hardrock Mine
a Curragh Resources Inc. Faro and Vangorda Mines, Zn, Pb, Ag
b Curragh Resources Inc. and Hillsborough Resources Ltd. Sä Dena Hes Mine, Zn, Pb
c Anooraq Resources Ltd., Rhodonite
d Max Rosequist, King Arctic, Jade
1 to 8 Areas of Placer Mine Operations
20 Areas of Mineral Exploration Activity Refer to Yukon Table and Text
LEAD, ZINC, COPPER
GOLD, SILVER
OTHER
ROAD
SCALE
80 0 80 km.
Arctic Ocean
Inuvik
N.W.T.
YUKON
ALASKA
Dawson
Mayo
Carmacks
Ross River
Whitehorse
Watson Lake
Yukon River
60°
140°
135°
130°
125°
BRITISH COLUMBIA

Curragh Resources Inc. and Hillsborough Resources Ltd., Sa Dena Hes Mine

Curragh Resources owns 80 per cent of the Sa Dena Hes zinc-lead mine (b) under a joint venture agreement with Hillsborough Resources Ltd., which owns 20 per cent. The $70-million project near Watson Lake was brought on stream in July 1991, when underground production mining started. On August 1, 1991 the mill started up, and during the remainder of the year a total of 44 998 t of zinc and lead concentrate were produced from 172 345 t of ore with an average combined zinc-plus-lead head grade of 20.2 per cent. Initial milling capacity is 1 500 tpd, and at lower grades capacity can be increased to 2 500 tpd. The mine will produce 120 000 to 150 000 t of zinc and lead concentrate per year and has a projected life of nine years.

Curragh successfully initiated an agreement with the Kaska Dena Nation, that provides for training, employment and business opportunities for the local Native peoples. Under a socio-economic agreement, the Kaska Dena will comprise up to 30 per cent of the work force. Also, the Kaska Dena Nation has an option to purchase a 5 per cent interest in the mine before the end of 1993.

Type:	underground
Location:	45 km north of Watson Lake
Product:	zinc, lead, silver
Mill Capacity:	1500-2 500 tpd
Tonnes Milled:	172 345 t
Reserves:	4.9 million t (November, 1991)
Reserves Grade:	4 per cent lead, 12.7 per cent zinc, 59.9 g of silver per t
Employees:	88 (December 31, 1991)

Seasonal Mine Operations

Anooraq Resources Ltd. produced rhodonite from the Marlin property (c), located near the head of Evelynn Creek, south of Quiet Lake. Anooraq produced 40 t of medium-to high-quality, dark pink to raspberry-coloured, gem quality material.

The King Arctic property (d) continued to produce nephrite jade. It is located in the Frances Lake area, north of Watson Lake. Exploration and mining of jade is conducted during the summer months.

Placer Mining

Placer gold production, reported by payments from approximately 194 placer mining operations in 1990, amounted to 3 482.7 kg of crude gold compared with 4 216.1 kg from about the same number of operations in 1990. The decrease in production in 1991 is attributed partly to the depletion of reserves in traditional mining districts.

Advanced Exploration and Development

In the Vangorda Plateau area, Curragh Resources Inc. was planning preproduction stripping of the GRUM zinc-lead deposit (a). The project requires an incremental capital outlay of $40 million to remove 74 000 tpd of overburden over approximately 10 months. At year end 1991, Curragh had all of the equipment and infrastructure in place to complete the stripping project, but work was delayed pending the availability of full financing.

Under an option agreement with Archer Cathro and Associates (1981) Limited, Western Copper Holdings Ltd. and Thermal Exploration Company increased both the grade and tonnage of the Williams Creek oxide copper-gold deposit (28), northwest of Carmacks. The companies completed a 55-hole 3 890-m diamond drill program. The tabular deposit is oxidized to a depth of 240 m along a strike length of 395 m. New reserves on the main zone, the largest of 13 zones on the property, are 13 million t grading 1.06 per cent copper, of which 85 per cent is in the oxide category. If developed as an open-pit mine operation, the companies are expecting to use a heap-leach/solvent extraction process followed by electrowinning to produce copper.

Wheaton River Minerals Ltd. could begin production on its wholly owned Skukum Creek gold project, in the Wheaton River area, 56 km south of Whitehorse, as early as September 1992. The property (29) includes the recently acquired Skukum Creek deposit, purchased from Omni Resources Inc. and the adjacent Mount Skukum mine, purchased from Total Energold Corp. Proven, probable and possible reserves total 522 627 t grading 10.53 g of gold per t and 273.94 g of silver per t in three zones. Three drill holes totalling 1 050 m, were completed.

Mineral Dispositions

Quartz claims in good standing at the end of December 1991, totalled 42 268, a drop of 4 429 from the previous year. A total of 4 735 new quartz claims were staked in 1991, down 1 387 from the 1990 total of 6 122.

Table 2: Mineral Dispositions Staked and Lapsed, Yukon, 1989 and 1990

	1991 Calendar Year Staked (Lapsed)	1990 Calendar Year Staked (Lapsed)
Quartz Claims	4 735	6 122
	(7 658)	(10 380)
Placer Claims	1 141	1 503
	(1 272)	(1 218)
Placer Leases to Prospect	177	261
	(25)	(296)

Source: Department of Indian Affairs and Northern Development.

Table 3: Mineral Dispositions in Good Standing, Yukon, 1990 and 1991

	1991 December 31	1990 December 31
Quartz Claims	42 268	46 697
Placer Claims	17 801	17 741
Placer Leases to Prospect	251	345
Iron and Mica Claims	525	525
Coal Leases and Licences	36	36
Dredging Leases	7	12
Total	60 888	65 356

Source: Department of Indian Affairs and Northern Development.

Geoscience Support

On May 7, 1991 the Minister of DIAND and the Yukon government's Minister for Economic Development signed a five-year Canada Yukon Economic Development Agreement which includes a Canada Yukon Co-operation Agreement on Mineral Development. This provides for expenditures of up to $9 million during 1991-1996 including geoscience ($6.3 million), mineral technology ($1.8 million) and public information on mining ($0.9 million). Most of the geoscience funding will be directed to geological mapping.

The activities and recent publications of Exploration and Geological Services Division (EGSD), Northern Affairs Program, DIAND, in Yukon Region are described in the publication "*Yukon Exploration 1991*". This publication may be obtained by writing to Mr. S.R. Morison, Chief Geologist, Exploration and Geological Services Division, Northern Affairs Program, DIAND, 200 Range Road, Whitehorse, Yukon, Y1A 3V1.

Table 4:
Exploration Drilling, Yukon, 1991

Project	Company	Diamond Drilling		Percussion Drilling	
		Metres	No. of Holes	Metres	No. of Holes
TOM	Cominco	2 883	8		
NIDD	Cominco	1 768	6		
JASON	Phelps Dodge	2 556	8		
BLENDE	NDU/Billiton	11 525	62		
BREWERY CREEK	Hemlo/Loki	4 030	59	34 675	671
WILLIAMS CREEK	WHC/Thermal	3 890	55		
CARPENTER RIDGE	Big Creek Res.	610	5		
NUCLEUS/REVENUE	Big Creek Res.	1 770	16		
GOLDSTAR	Gagan Gold				4
HAGGART CREEK	H-6000/Amax	2 500	16		
ITSI	Noranda	427	7		
TAY-LP	Pacific Comox			942	33
BARB	Pulse Resources	304	4		
CLEAR LAKE	Total Energold/Mitsui	4 500	19		
CHIEFTAIN HILL	Wheaton River Min.	1 050	3		
CASH	Big Creek Res.	396	2		

Source: Exploration and Geological Services Division,
Department of Indian Affairs and Northern Development, Whitehorse, Yukon.

Mineral Exploration

Mineral exploration expenditures increased to $16 million in 1991 from $12 million in 1990. There were approximately 60 individual exploration projects in 1991, about the same number as in the previous year. Projects conducted by seven major mining corporations accounted for three quarters of the 1991 exploration expenditures. With the exception of Brewery Creek, a gold property in the Dawson area, all of these projects involved extensive diamond drilling on advanced base metal properties.

Exploration Projects

Base Metals

Billiton Metals Canada Incorporated continued its exploration program on NDU Resources Ltd.'s BLENDE zinc-lead-silver property, northeast of Mayo (9). The program involved geophysical surveys and diamond drilling over a 3.3 km strike length. Most of the mineralization is structurally controlled, forming a tabular stockwork and breccia zones in the Middle Proterozoic Gillespie Group dolomite. The deposit is believed to be a Mississippi Valley type deposit. (see MAP 1)

Drilling in 1991 totalled 11 525 m in 62 holes, including 15 holes in the west zone, 34 holes in the east zone and 13 in the centre, between the east and west zones. The 1991 program significantly increased the geological reserves to approximately 19.4 million t grading 2.81 per cent

lead, 3.04 per cent zinc and 55.88 g of silver per t. These reserves are amenable to open pit mining at a strip ratio of 2.1:1.

Total Energold Corporation and Mitsui Kinzoku Resources of Canada Inc. explored the Clear Lake (10) shale-hosted zinc-lead deposit, located 80 km northwest of Faro. Since 1978, drilling of the Clear Lake deposit has outlined approximately 30 million t of massive sulphides, mainly pyrite, including 5.53 million t grading 11.34 per cent zinc, 1.99 per cent lead and 40.8 g of silver per t. The 1991 work consisted of gravity, induced polarization (IP) and magnetometer surveys, followed by 19 diamond drill holes totalling 4 500 m.

In the Macmillan Pass area, northeast of Ross River, Cominco Ltd. continued its extensive program to test the extensions of TOM deposit (11), under an option agreement with Hudson Bay Mining and Smelting Co. Limited. Published mineable reserves for the TOM deposit are 9 283 700 t grading 7.49 per cent lead, 6.19 per cent zinc and 69.4 g of silver per t. In 1991, Cominco drilled eight holes on peripheral geochemical and geological targets, for a total of 2 883 m. The company found no new centres of mineralization, and the option was dropped.

Cominco also continued drilling on its wholly owned NIDD (12) zinc property, located 20 km northwest of the TOM deposit. The company drilled six holes totalling 1 768 m on the main Boundary Creek mineralized centre and its western extension.

Also in the Macmillan Pass area, Phelps Dodge Corporation of Canada continued its option on the JASON (13) property, owned by the Western Canadian Mining Corporation, Ogilvie Mineral Corp. and Abermin Corporation. Phelps Dodge completed eight diamond drill holes totalling 2 556 m to test favourable stratigraphy south and east of the Main and South zones. The three known zones of the JASON deposit have geological reserves of 14.1 million tonnes grading 7.09 per cent lead, 6.57 per cent zinc and 79.9 g of silver per t.

Big Creek Resources Ltd. conducted a diamond drill program on the REVENUE-NUCLEUS (14) copper porphyry properties. Two drill holes encountered copper and gold-bearing supergene and hypogene mineralization.

First Yukon Silver Resources conducted trenching on the DAN (formerly BAR) showing (15) near Swift River. Trenching exposed zinc-bearing mineralization up to 1.5 m wide.

Placer Dome Inc. conducted geological, geochemical and ground geophysical surveys on the KONA (formerly Fyre Lake) copper-zinc-silver property north of Watson Lake. The company optioned the property (16) from Welcome North Resources Limited. The Kona deposit is a flat-lying volcanogenic massive sulphide deposit with geological reserves of 1.5 million t, grading 1 per cent copper, 1 per cent zinc, 4.66 g of silver per t and 0.62 g of gold per t.

Big Creek Resources Ltd. explored the CARPENTER RIDGE (17) lead-zinc-silver property, 25 km west of the BLENDE property. The company drilled five diamond drill holes totalling 610 m. Galena and sphalerite occur in moderately dipping veins and breccia adjacent to Cretaceous and older diorite dikes, which cut Proterozoic Gillespie Lake Group dolomite. The drilling program resulted in the intersection of several veins including one of 5 m grading 9.5 per cent combined lead and zinc, and another of 9.3 m grading 4.5 per cent combined lead and zinc.

Noranda Exploration Co. Ltd. conducted trenching on the AZ property (18), north of White River. Copper-gold skarn mineralization occurs in the Chitistone limestone and calcareous rock of Late Triassic age and as disseminations within the underlying Nikolai Greenstone amygdaloidal basalts. Work in 1991 also included mapping, soil sampling and geophysical surveys. Areas with coincident anomalies were trenched.

Pulse Resources Ltd. funded a drill program on Barytex Resources Corporation's MATT BERRY property (19), located 160 km north of Watson Lake. The property is also known as the BARB. The BARB deposit is a sediment-hosted zinc-lead-silver deposit with drill inferred geological reserves of 530 000 t grading 10 per cent combined zinc and lead and 102.85 g of silver per t. Drilling in 1991 was concentrated on the Money Zone, located 1.5 km northwest of the BARB deposit.

Gold

On the BREWERY CREEK property (20), east of Dawson, Loki Gold Corporation (49 per cent) and Hemlo Gold Mines Inc. (51 per cent) continued extensive drilling to further delineate known mineralization. The 1991 work included 671 reverse circulation drill holes totalling 34 675 m, 59 diamond drill holes totalling 4 030 m and 49 trenches totalling 12 727 cubic m. Calculated diluted preliminary reserves amount to 15.46 million t in nine deposits with an average grade of 1.88 g of gold per t.

Oxide reserves account for 10.8 million t of the total and grade 1.988 g of gold per t with a stripping ratio of 1:1.17. This ore estimate represents a modest increase from the estimate released in 1990.

Amax Gold Inc. conducted a drilling and trenching program in the Mayo Mining District near SCHEELITE DOME and HAGGART CREEK (21). The company completed 2 500 m of diamond drilling and 2.3 km of trenching.

Aurchem Exploration continued exploration on its GOULTER option (22) located west of Carmacks adjacent to the MT. NANSEN property of BYG Natural Resources Inc. The GOULTER property includes the Willow Creek and Eliza Creek zones. Work in 1991 consisted of a grid expansion followed by a property-wide induced polarization (IP) survey and a VLF electromagnetic survey. Magnetometer surveys were conducted over specific target areas.

On the ITSI property (23), south of Macmillan Pass, Noranda Exploration Co. Ltd. conducted a trenching and diamond drilling program. The company also trenched on the PUTZ-BENNETT property, located north of Macmillan Pass. The company targeted gold-bearing quartz veins which occur along the margins of Cretaceous intrusions.

Pacific Comox Resources Ltd. explored the SEAGULL CREEK (TAY-LP) (24) property, located south of Ross River. The 1991 program included 653 line-kilometres of airborne magnetometer and electromagnetic surveys and 942 m of reverse circulation drilling. Seventy claims were staked. The drill program located three zones of significant mineralization in the west zone.

Noranda Exploration Co. Ltd. explored the JOSEPHINE property (25), in the Clear Creek area. Work included geochemical sampling, magnetometer and induced polarization (IP) surveys and trenching. Gold and arsenopyrite occur in veins within a shear zone on the property.

The BEAR property (26), located south of Antimony Mountain, was staked by Noranda Exploration Co. Ltd., in 1990. Work in 1991 consisted of geological, geochemical and geophysical surveys followed by trenching.

Arbor Resources Inc. continued exploration on its substantial holdings in the Klondike area near Dawson. Reconnaissance work on recently staked ground and more detailed work near the LONESTAR property (27) took place in 1991. The detailed work included trenching which revealed a shear zone running parallel to Eldorado Creek. Chip sampling on the structure gave encouraging assays.

MINES AND MINERAL ACTIVITIES 1991

Northwest Territories

Mineral Production

Five gold mines and two zinc-lead mines operated in the Northwest Territories during 1991 (Map 2). Production statistics for the mines are given in Table 5.

The value of mineral production in the Northwest Territories was estimated at $544.6 million in 1991 compared with $729.7 million in 1990. The lower value of mineral production in 1991, compared with the previous year, was due largely to lower zinc, lead, gold and silver prices.

Production at Northwest Gold Corp.'s new Colomac mine was suspended at the end of June 1991 after 14 months of production. The mine was mothballed and placed on a standby basis pending an improvement in gold prices and financial restructuring.

Together lead and zinc accounted for 56.1 per cent of the total value of mineral production in the Northwest Territories, while gold accounted for 40.5 per cent.

Exploration expenditures were up slightly over 1990, when expenditures amounted to some $36 million. In mid-November, a claim-staking rush in the central part of Slave Province, north of Yellowknife, was started when BHP-Utah Mines Ltd. and Dia Met Minerals Ltd. announced the discovery of a diamondiferous kimberlite pipe. The companies announced that 81 small diamonds, all measuring less than two millimetres in diameter, had been recovered from a 59 kg sample of kimberlite drillcore.

Between November 1, 1991 and April 10, 1992, 2 582 new claims were recorded in the Northwest Territories covering 7 458 sq km. Most of the staking was in the central part of Slave Province.

The mineral industry in the Northwest Territories accounted for 20.7 per cent of the zinc, 13.1 per cent of the lead and 9.4 per cent of the gold produced in Canada during 1991. These metals accounted for 5.1 per cent of the value of Canada's metallic mineral production compared with 6.9 per cent in 1990.

The six operating mines in the Northwest Territories at year end 1991 employed 1 565 people compared with 1950 people at year end 1990.

Mines

Cominco Ltd., Polaris Mine

The Polaris zinc-lead mine (b)", concentrator and related exploration properties are 77.5 per cent owned by Cominco and 22.5 per cent by Pine Point Mines Limited. Cominco is the operator of the joint venture. The underground Polaris mine, located on Little Cornwallis Island, is celebrating its tenth full year of operation in 1992.

In 1991, the Polaris mill processed a record 1 069 300 t of ore grading 12.5 per cent zinc and 3.2 per cent lead to yield 163 700 t of zinc concentrate grading 61.3 per cent zinc and 31 400 t of lead concentrate grading 77.7 per cent lead. The average ore grade processed in 1991 was 12.5 per cent zinc and 3.2 per cent lead compared with 14.4 per cent zinc and 4.0 per cent lead in 1990. Ten shipments of lead and zinc were made to Europe between June 25,1991 and October 27, 1991 for a total of 252 000 t.

Exploration drilling was carried out on nearby Truro Island, and results were sufficiently encouraging to justify further work in 1992.

Type:	underground
Location:	Little Cornwallis Island (120 km northwest of Resolute)
Product:	zinc, lead
Mill Capacity:	3 100 tpd
Tonnes Milled:	1 609 300 t
Reserves:	10.02 million t (December31,1991)
Reserve Grade:	14.0 per cent zinc, 3.9 per cent lead
Employees:	246 (December 31,1991)

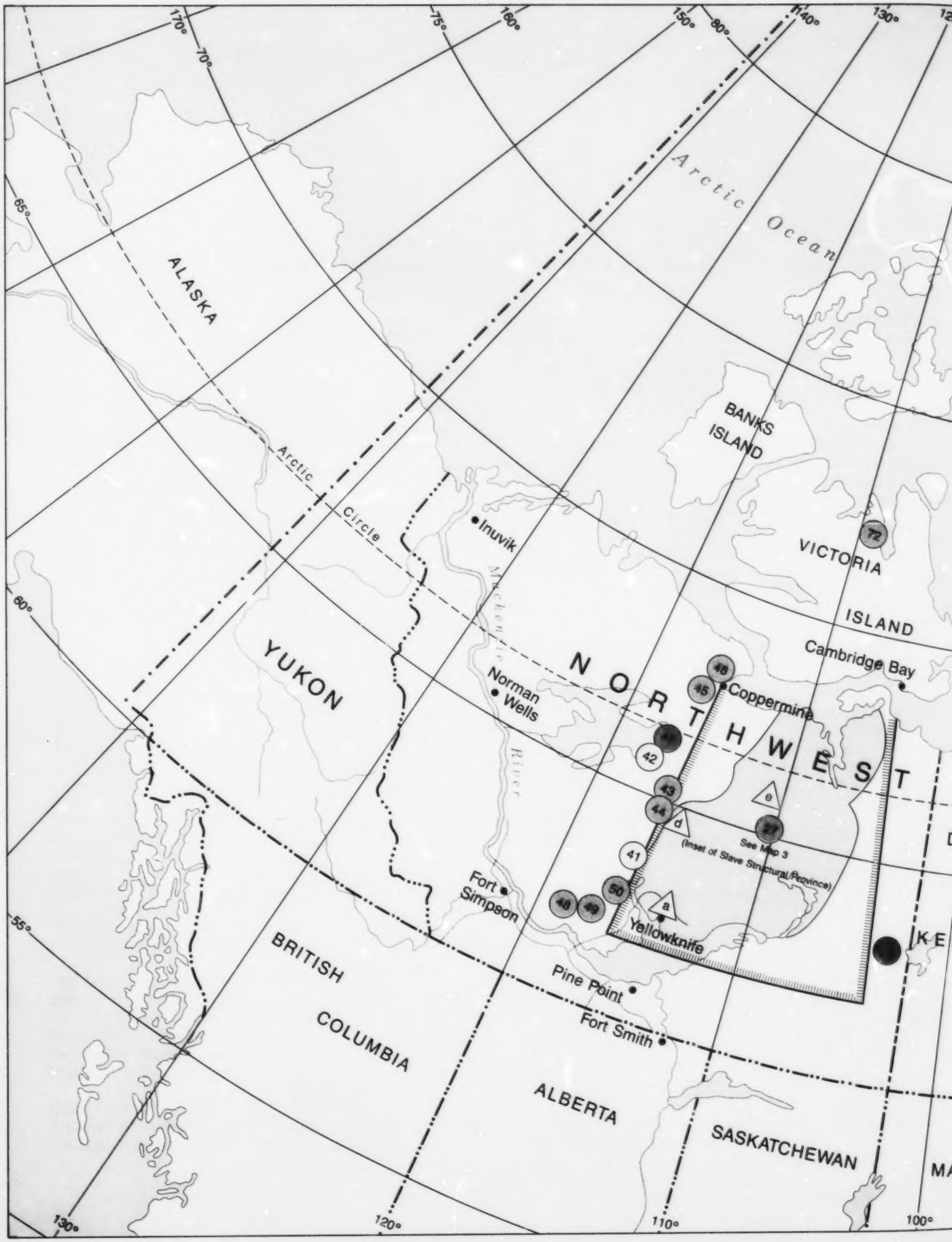
" Numbers or letters in parenthesis indicate the location of the property on Maps 2 and 3.

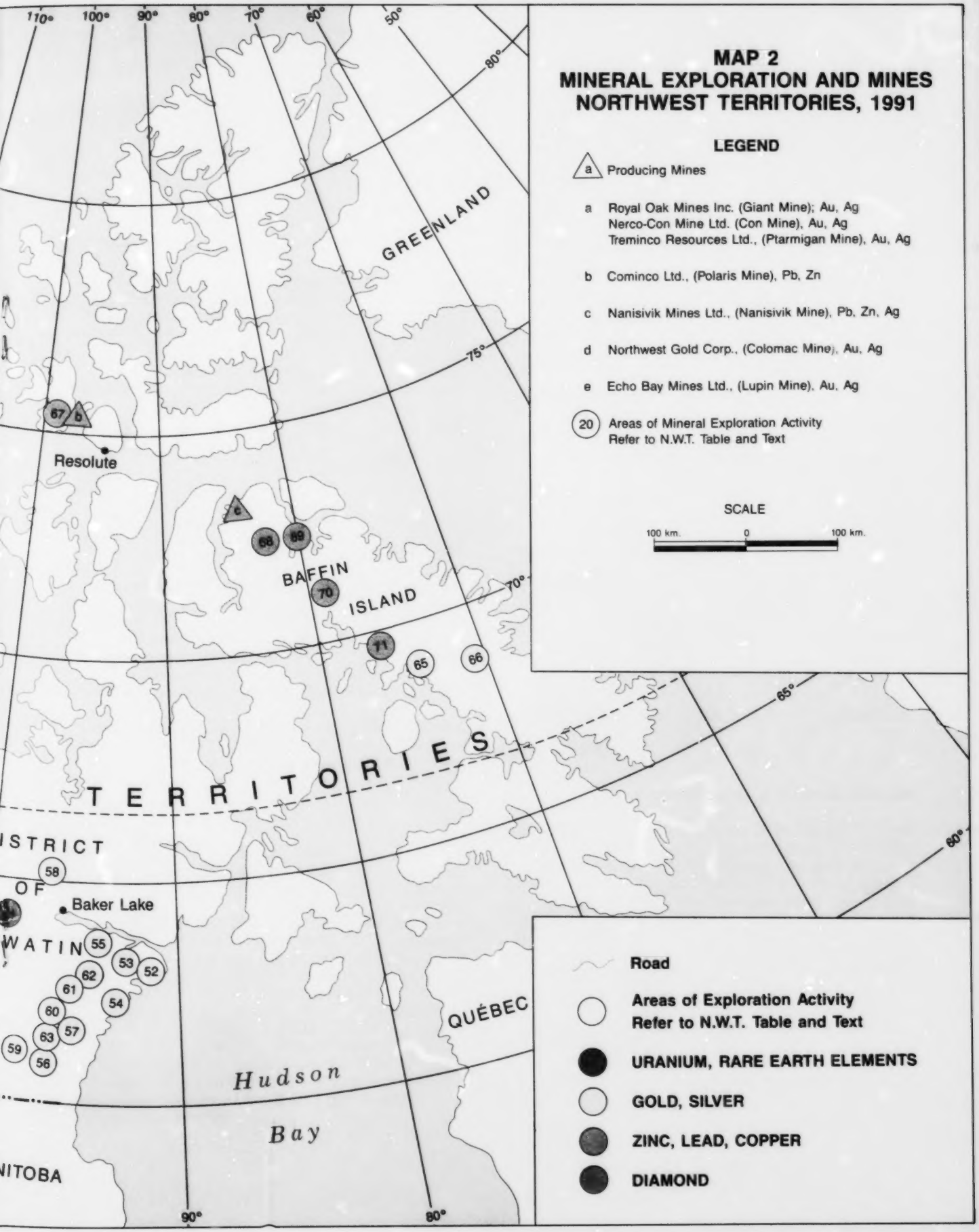
Table 5:
Mineral Production of Operating Mines, Northwest Territories, 1989, 1990 and 1991

Company, Mine and Commodity	1989 t	1989 kg	1990 t	1990 kg	1991(P) t	1991(P) kg
Cominco Ltd.						
Polaris Mine						
zinc	139 190		142 392		100 348	
lead	32 060		37 692		24 398	
Echo Bay Mines Ltd.						
Lupin Mine						
gold		6 082		6 072		6 746
Royal Oak Mines Inc.						
Giant Mine						
gold		3 270		3 647		3 183
Nanisivik Mines Ltd.						
Nanisivik Mine						
zinc	57 328		56 200		54 800	
lead	2 448		1 400		400	
silver		16 956		18 100		18 500
NERCO Con Mine Ltd.						
Con Mine						
gold		2 992		3 643		3 825
silver		621		N/A		N/A
Northwest Gold Corp.						
Colomac Mine						
gold				2 130		2 423
Treminco Resources Ltd.						
Ptarmigan Mine						
gold		478		585		N/A

Source: Department of Indian Affairs and Northern Development. These figures are those reported by the mines as production and will not match Statistics Canada's production figures which are based on metals sold or shipped.

(P) = Preliminary N/A = Not available


Arctic Ocean
ALASKA
BANKS ISLAND
VICTORIA ISLAND
Arctic Circle
Inuvik
Mackenzie River
Norman Wells
YUKON
NORTHWEST
Coppermine
Cambridge Bay
See Map 3
(Inset of Slave Structural Province)
Fort Simpson
Yellowknife
Pine Point
Fort Smith
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
170°
160°
150°
140°
130°
120°
110°
100°
75°
70°
65°
60°
55°


MAP 2
MINERAL EXPLORATION AND MINES
NORTHWEST TERRITORIES, 1991
LEGEND
a Producing Mines
a Royal Oak Mines Inc. (Giant Mine); Au, Ag
Nerco-Con Mine Ltd. (Con Mine), Au, Ag
Treminco Resources Ltd., (Ptarmigan Mine), Au, Ag
b Cominco Ltd., (Polaris Mine), Pb, Zn
c Nanisivik Mines Ltd., (Nanisivik Mine), Pb, Zn, Ag
d Northwest Gold Corp., (Colomac Mine), Au, Ag
e Echo Bay Mines Ltd., (Lupin Mine), Au, Ag
20 Areas of Mineral Exploration Activity
Refer to N.W.T. Table and Text
SCALE
100 km. 0 100 km.
GREENLAND
BAFFIN ISLAND
Resolute
Baker Lake
QUÉBEC
Hudson Bay
TERRITORIES
ISTRICT OF
WATIN
NITOBA
110°
100°
90°
80°
70°
60°
50°
80°
75°
70°
65°
60°
90°
80°
Road
Areas of Exploration Activity
Refer to N.W.T. Table and Text
URANIUM, RARE EARTH ELEMENTS
GOLD, SILVER
ZINC, LEAD, COPPER
DIAMOND

Echo Bay Mines Ltd., Lupin Mine

The Lupin gold mine (e) is located 90 km south of the Arctic Circle and approximately 400 km northeast of Yellowknife. In 1991, the mine produced a record 6 745.6 kg of gold compared with 6 072.4 kg in 1990. The Lupin mill processed 1 813 tpd of ore for a total of approximately 660 000 t. This compared with 1 726 tpd of ore for a total of 628 000 t in 1990.

Mining in 1991 was at depths ranging from 120 m to 640 m. Lupin's reserves extend to a depth of 1 170 m, and in 1991 development drifts were extended at a depth of 1 130 m.

Type:	underground
Location:	400 km northeast of Yellowknife
Product:	gold
Mill Capacity:	2 000 tpd
Tonnes Milled:	660 000
Reserves:	3.84 million t (December 31,1991)
Reserve Grade:	10.15 g of gold per t
Employees:	350

Nanisivik Mines Ltd., Nanisivik Mine

Nanisivik Mines Ltd. is wholly owned by Conwest Exploration Company Limited. In 1991, mill production at the Nanisivik mine (e) totalled to 705 000 t of ore at an average grade of 8.1 per cent zinc, 0.4 per cent lead and 36 g of silver per t compared with 716 400 t grading 8.1per cent zinc, 0.4 per cent lead and 35 g of silver per t in 1990. Zinc concentrate production in 1991 declined slightly to 98 200 t from 100 700 t in 1990. The main ore zone at the Nanisivik mine contributed about 30 per cent of the mill feed in 1991; the remainder came from satellite zones. The company replaced approximately 60 per cent of the ore mined during the year with new ore reserve additions. It is anticipated that the existing reserve base, together with anticipated additional reserves, will support continuing production to 1997.

Type:	underground
Location:	27 km east of Arctic Bay, Baffin Island
Product:	zinc, lead, silver
Mill Capacity:	2 000 tpd
Tonnes Milled:	705 000 t
Reserves:	2 420 000 t (December 31,1991)
Reserve Grade:	8.5 per cent zinc, 0.3 per cent lead, 40 g of silver per t
Employees:	215

NERCO Con Mine Ltd., Con Mine

NERCO Con Mine Ltd. is a unit of NERCO Minerals Company and both are wholly owned by NERCO Inc. In 1991, NERCO Con (a) set a new production record of 3 825 kg of gold from 332 000 t of ore milled. This compares with 3 642.7 kg of gold produced in 1990 from 285 960 t of ore. Production was from underground workings between the 2 300 - and 5900-foot levels.

A $19 million autoclave pressure oxidation circuit is being added to the NERCO Con mill to treat refractory ore, arsenic sludges and calcine wastes.

Type:	underground
Location:	1.4 km south of Yellowknife
Product:	gold, silver
Mill Capacity:	650 tpd
Tonnes Milled:	332 000 t
Reserves:	3.11 million t (December 31, 1991)
Reserve Grade:	10.29 g of gold per t
Employees:	395

Northwest Gold Corp., Colomac Mine

Northwest Gold Corp., the owner and operator of the Colomac gold mine (d), is 52 per cent owned by Northgate ExplorationLtd. The Colomac Mine began operations on May 1, 1990, and operated continuously for the next 14 months. Due to financial constraints, lower than anticipated operating performances and low gold prices, the operation was suspended on June 30, 1991 and was mothballed and placed on a standby basis.

During 1991, a total of 1.12 million t of ore were processed to yield approximately 2 423.6 kg of gold.

Type:	open pit
Location:	219 km north-northwest of Yellowknife
Product:	gold
Mill Capacity:	10 000 tpd
Tonnes Milled:	1.12 million t
Reserves:	N/A
Reserve Grade:	N/A
Employees:	190 (May 31,1991)

N/A: Not available

Royal Oak Mines Inc., Giant Mine

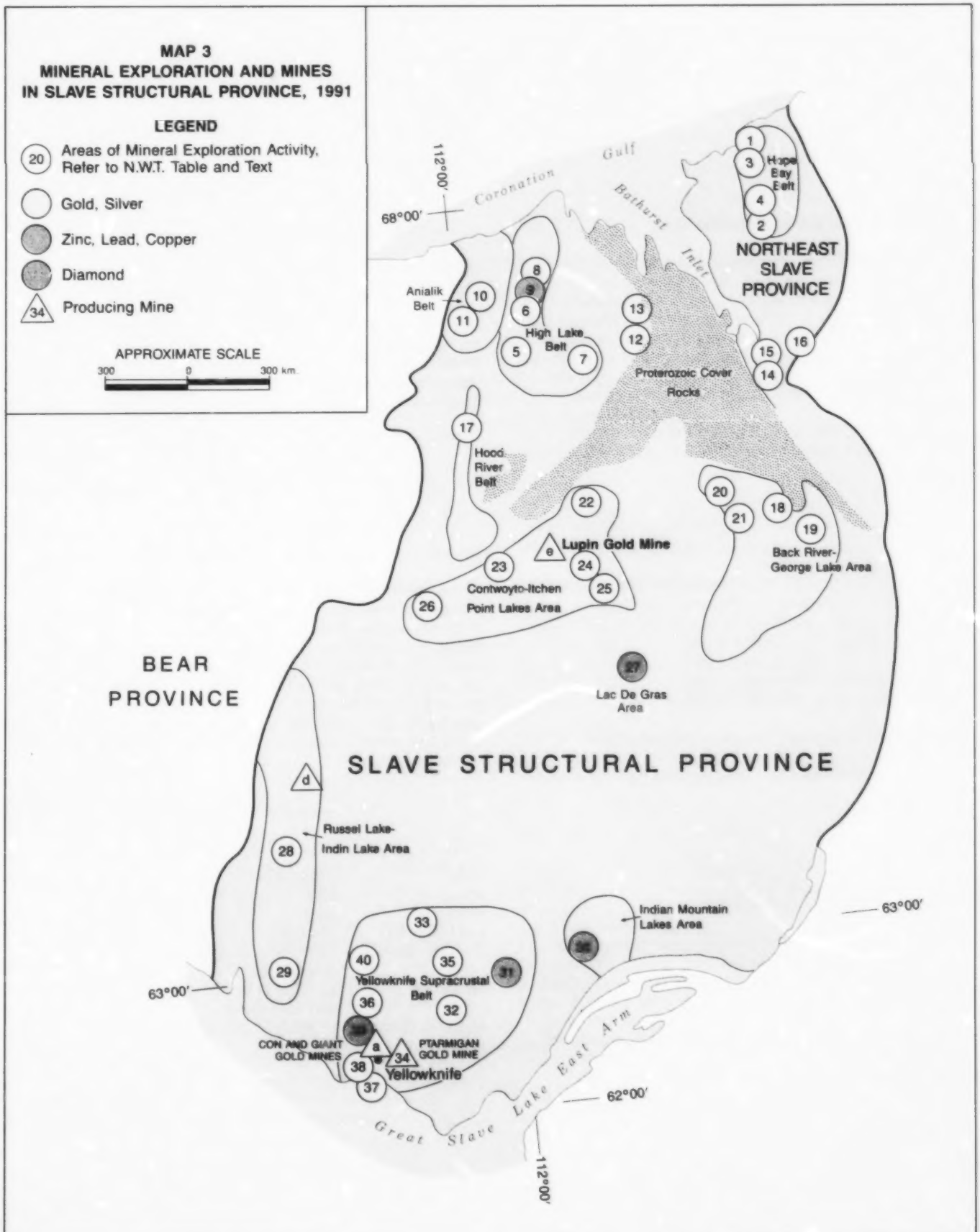
In July 1991, Royal Oak Mines Inc. was formed by the amalgamation of Royal Oak Resources Ltd., Pamour Inc., Pamorex Minerals Inc., Akaitcho Yellowknife Gold Mines Limited and Giant Yellowknife Mines Limited. All the ore production from the Giant mine (a) in 1991 was from underground workings. The Giant mill processed 390 065 t of ore at an average grade of 9.394 g of gold per t to yield 3 183 kg of gold. This compares with 347 079 t of ore at an average grade of 9.942 g of gold per t to yield 3 009.8 kg of gold and 649 156 t of tailings at an average grade of 2.08 g of gold per t to yield 637.2 kg of gold in 1990.

Type:	underground
Location:	2.4 km north of Yellowknife
Product:	gold, silver
Mill Capacity:	1 000 tpd
Tonnes Milled:	390 065 t
Reserves:	2 121 903 t (December 31, 1991)
Reserve Grade:	10.662 g of gold per t
Employees:	325

Treminco Resources Ltd., Ptarmigan Mine

At the Ptarmigan mine (a), gold production for the company's 1991 fiscal year (August 1,1990 to July 31, 1991) amounted to 462.38 kg. The total ore milled during this period was 52 707 t grading 9.70 g of gold per t. For the six month period from August 1, 1991 to January 31,1992, production amounted to 277.35 kg of gold from a mill throughput of 22 831 t grading 12.72 g of gold per t. Ore production was from the 400-foot level of the C vein and the 450-,600- and 750-foot levels of the Ptarmigan mine.

Type:	underground
Location:	20 km east of Yellowknife
Product:	gold
Mill Capacity:	180 tpd
Tonnes Milled:	52 707 (fiscal year 1991 ended July 31,1991)
Reserves:	121 653 t (July 31,1991 at Ptarmigan and Tom mines)
Reserve Grade:	10.973g of gold per t
Employees:	30


MAP 3
MINERAL EXPLORATION AND MINES
IN SLAVE STRUCTURAL PROVINCE, 1991
LEGEND
20 Areas of Mineral Exploration Activity, Refer to N.W.T. Table and Text
Gold, Silver
Zinc, Lead, Copper
Diamond
34 Producing Mine
APPROXIMATE SCALE
300 0 300 km
112°00'
68°00'
Coronation Gulf
Bathurst Inlet
NORTHEAST SLAVE PROVINCE
Hope Bay Belt
Anialik Belt
High Lake Belt
Proterozoic Cover Rocks
Hood River Belt
Lupin Gold Mine
Contwoyto-Itchen Point Lakes Area
Back River-George Lake Area
Lac De Gras Area
BEAR PROVINCE
SLAVE STRUCTURAL PROVINCE
Russel Lake-Indin Lake Area
Indian Mountain Lakes Area
63°00'
Yellowknife Supracrustal Belt
CON AND GIANT GOLD MINES
PTARMIGAN GOLD MINE
Yellowknife
Great Slave Lake East Arm
62°00'
112°00'

Development

Ger-Mac Exploration Ltd. collared a new portal on the MON gold property (36), drove 153 m of drifts and raises, and mined a 550 t bulk sample from underground. The company planned to bring a small mill to the site in the winter of 1991-1992 to process the ore.

Mineral Dispositions

Staking in 1991 was concentrated mainly in the shield areas of Slave Province, Bear Province and Keewatin District. Gold and diamonds were the primary targets.

The number of claims staked in 1991 increased dramatically in November and December after the announcement of the discovery of diamonds in the Lac de Gras area. Most of this staking was in National Topographic Sheet areas (NTS) 75 D and E and in 86A. By year end, 831 claims covering 666374 hectares (ha) were recorded compared with 441 claims covering 355 346 ha in 1990 (Table 6). The Lac de Gras diamond staking accounted for approximately 515 000 ha in 1991 and nearly 800 000 ha in January and February 1992.

Thirty-four prospecting permits were issued at the end of January 1991. Copper was the primary target of 12 permits issued on Victoria Island, and gold was the major target of most of the 15 prospecting permits issued in the Rae and Hearne provinces of southeast Mackenzie District, east of Great Slave Lake.

Geoscience Support

The Canada Northwest Territories Economic Development Framework Agreement was signed in February 1991 by the Minister of DIAND and the Government of the Northwest Territories' Minister of Economic Development and Tourism. Under the Agreement, the Department of Indian and Northern Affairs and the Government of the Northwest Territories will co-operate in the delivery of economic development initiatives. The Mineral Development Agreement, known as the Mineral Initiative Program, has a total budget of $8.2 million over the period from, 1991-1996, divided as follows:

Geoscience Initiative	$7 500 000
Technology Initiative	$200 000
Information Initiative	$200 000
Prospectors Initiative	$300 000

The activities and recent publications of Geology Division, Northern Affairs Program, DIAND, in Northwest Territories Region are described in the publication entitled *Exploration Overview 1991*. It may be obtained by writing to Dr. W. Padgham, Chief Geologist, Geology Division, Northern Affairs Program, DIAND, P.O. Box 1500, Yellowknife, N.W.T., X1A 2R3.

Mineral Exploration

Mineral exploration expenditures in the Northwest Territories in 1991 were estimated to have marginally increased over the $36 million expended in 1990. Some 109 properties were explored in 1991 compared with 92 in 1990. Major mining companies were responsible for approximately 80 per cent of the exploration expenditures.

Table 6: Mineral Claims, Leased Claims, Prospecting Permits, Northwest Territories, 1990 and 1991

	1991 Calendar Year	1990 Calendar Year
Number of Claims and Leases in Good Standing	3 859	3 868
Hectares	2 519 428	2 329 769
Number of Leased Claims	11 396	11 548
Hectares (Surveyed)	277 181	281 144
Claims Recorded	831	441
Hectares	666 374	355 346
Representation Work on Claims only ($s)	6 533 062	17 834 000
Prospecting Permits Issued	34	67
Hectares	634 940	1 295 853
Prospecting Permits Cancelled, Expired or Relinquished	49	20
Prospecting Permits In Good Standing	91	106
Hectares	1 760 476	1 989 083
Exploration Reported on Prospecting Permits ($s)	731 549	4 841 751

Source: Mining Lands Division, Department of Indian Affairs and Northern Development, Yellowknife, N.W.T.

Table 7: Diamond Drilling, Northwest Territories, 1990 and 1991

	1991 Calendar Year	1990 Calendar Year
	Metres (m)	
Surface Drilling	110 527	113 933
Underground Drilling	73 347	74 745
Total Drilling	183 874	188 678

Source: Geology Division, Department of Indian Affairs and Northern Development, Yellowknife, N.W.T.

Major programs include BHP-Utah Mine's program for gold on the CROWN-ULU claims (5) between the Hood and James rivers; the program by Homestake Mining Company and Kerr-McGee Corporation on the George Lake iron formation-hosted gold deposits in the Back River area, south of Bathurst Inlet (18); the program by Lucky Eagle Mines, Agnico Eagle Mines Ltd. and Hecla Mining Company of Canada Ltd. on the Meadowbank River iron formation-hosted gold deposits, north of Baker Lake (58); the program of Asamera Minerals Inc. and Comaplex Minerals Corp. on iron formation-hosted gold deposits, northeast of Rankin Inlet (52); and the program of Urangesellschaft Canada Ltd., PNC Exploration (Canada) Co. Ltd. and Daewoo Corp. on uranium prospects, west of Baker Lake (64) and southwest of the Kiggavik uranium deposit. All of these projects included significant expenditures on diamond drilling.

One of the most interesting exploration plays of the decade is unfolding in the central part of Slave Province where BHP-Utah Mines and Dia Met Minerals have acquired a large block of ground, approximately 815 square kilometres in area, covering their Lac de Gras diamondiferous kimberlite discovery (27). Diamond exploration gained prominence in November 1991, when Dia Met Minerals announced the recovery of 81 small diamonds from a drillcore section. A bulk sample was obtained from the discovery kimberlite pipe using a drill rig during the winter of 1992 and was shipped to a Fort Collins, Colorado diamond recovery plant during the spring of 1992. A small mobile plant was brought to the site in 1991 to test till and esker samples for kimberlite indicator minerals.

Diamond drilling in 1991 was mainly for gold, and the major exploration programs mentioned previously accounted for most of the drilling (Table 7).

Exploration Projects

Northern Slave Structural Province

Hope Lake Volcanic Belt

GSA Management Ltd. and Goldcorp Investments Ltd. drilled several holes along the northeast trend of the Wombat (Granite) gold prospect at Roberts Lake (1) (see Map 2 and Map 3).

BHP-Utah Mines Ltd. staked the BOSTON (2), SANTIAGO & MADRID (3) and HAVANNA (4) claims. Prospecting and geological mapping were conducted on the BOSTON and KAMIK (2) claims. Twenty-five line-kilometres of a VLF magnetometer survey were completed on the BOSTON claims, and 14 line-kilometres of a VLF magnetometer survey were completed on the KAMIK claims.

High Lake and Anialik Volcanic Belts

BHP-Utah Mines Ltd. explored the central part of the High Lake Belt on a large package which includes the DEN-FIDO group, optioned from Aber Resources. The focus was on the ULU property (5). Surveys on the property included geological mapping, 32.1 line-kilometres of a VLF magnetometer survey, 11.0 line-kilometres of an induced polarization (IP) survey and 8 line-kilometres of a soil geochemical survey. Three trenches totalling 45 m in length were excavated, and a total of 21 000 m was drilled in 42 holes to delineate the FLOOD ZONE gold deposit and to test peripheral targets. The deposit is a fracture-controlled quartz-vein and silicified zone with a strike length of approximately 400 m.

On the adjacent CROWN and DEN-FIDO claims (5), BHP-Utah completed a geological mapping program. On the CROWN property, a 5 line-kilometre VLF electromagnetic and magnetometer survey, and a HL electro-

magnetic survey were completed. On the DEN-FIDO, a 14 line-kilometre VLF electromagnetic and magnetometer survey was completed. On the CROWN claims, a polymetallic zone in metavolcanics was tested with 484 m of drilling in two holes. On the DEN-FIDO claims, five holes totalling 403 m were completed. To the south, geological mapping was conducted on the PULSE, KINDLE AND SINGLETON claims.

On the BAMAKO-PARIS claims (6), BHP-Utah conducted geological mapping and completed 25 line-kilometres of a VLF electromagnetic and magnetometer survey. Mapping was completed on the nearby BRAVO claims.

On the HOTEL claims (7), BHP-Utah conducted geological mapping and completed a 3 line-kilometre VLF electromagnetic and magnetometer survey. A gold showing was tested with 325 m of drilling in seven holes. On the nearby SPARK claim, geological mapping and a small soil-sampling survey were conducted.

In the northern High Lake Belt, BHP-Utah completed 1:10 000 scale geological mapping on the CAIRO, ROMA and CYGNET properties (8). On the ROMA claims, geological mapping, soil sampling and VLF electromagnetic and magnetometer surveys were conducted on a 22 line-kilometre grid. Ten holes totalling 465 m were drilled to test a gold-bearing quartz vein. On CYGNET, 1:2000 scale geological mapping and VLF electromagnetic and magnetometer surveys were completed on a 22 line-kilometre grid to evaluate arsenopyrite-bearing shear targets.

Kennco Explorations (Canada) Limited conducted a geophysical and geochemical survey on its High Lake claims at High Lake (9). The claims contain the High Lake massive sulphide deposit.

BHP-Utah Mines Ltd. completed geological mapping on its ARNICA claims (10) in the Anialik Belt. The mapping extended into parts of surrounding Prospecting Permit 1181. In the southern Anialik Belt, BHP-Utah conducted geological mapping on Prospecting Permit 1285 (11).

Other Projects in Northern Slave Structural Province

Cogema Canada Ltd. explored for gold in the Torp Lake metasedimentary belt, adding the LUI claims (12) and MARC claims (13) to its holdings previously staked in the area, namely the JOE claim and EDY-LACH claim group.

Cogema Canada Ltd. explored several claim blocks in the Tinney Hills-Hiukitak River area for amphibolitic iron-formation hosted gold deposits (14, 15, 16).

Hood River Volcanic Belt

BHP-Utah Mines Ltd. prospected the TAK claim (17).

George Lake-Back River Area

The George Lake Joint Venture, comprising Homestake Mineral Development Company (73.75 per cent) and Kerr-McGee Corporation (26.25 per cent), continued to work on gold prospects in iron formations at George Lake (18). The 1991 program continued intensive exploration on the property and was principally directed to infill drilling on the Locale 1 and Locale 2 gold deposits. On the BRAU claims a total of 28690 m were drilled in 140 holes to test gold deposits in iron formation. Activities also included trenching, ground geophysical surveys and geological mapping. Mining of underground bulk samples is anticipated in 1992.

The Back River Joint Venture, comprising Homestake Mining Company Ltd., Kerr-McGee Corporation and the MacLab Group, conducted geological and geophysical surveys and drilled targets at Boot Lake (19). The project was managed by Trigg Woollett Olsen Consulting Ltd.

Echo Bay Mines Ltd. drilled for Bathurst-Norseman (Hackett River) style massive sulphide mineralization on the PXD-FEG-BEB claim group (20) and drilled iron-formation targets for gold on the BUCK-NUTS claim group (21). The company conducted reconnaissance surveys on its properties in the Beechy Lake-Back River area.

Contwoyto-Itchen-Point Lakes Area

Exploration in this area was for Lupin-type iron-formation hosted gold deposits.

Joint venture partners, Cominco Ltd., the operator, and Cogema Canada Ltd. continued work on the COCO claims (22) by prospecting and conducting 60 line-kilometres of magnetometer and HLelectromagnetic surveys. Electromagnetic conductors were tested by 915 m of drilling in 10 holes.

Cominco Ltd. drilled 10 holes totalling 1 200 m to test the LST claim (23). Drilling intersected geochemically anomalous sulphide-rich iron formations.

Echo Bay Mines Ltd. continued exploration on its Lupin Mine leases, the adjacent PXD 2 claim and the FIN claim (e). On the leases and the PXD 2 claim, a 200 line-kilometre HL electromagnetic survey and magnetometer survey were completed to end a three-year geophysical program targeted at iron formations. Mapping, sampling and prospecting together with 6 200 m of drilling in 65 holes were completed. On the FIN claim, 50 line-kilometres of magnetometer and HL electromagnetic surveys were conducted.

Cogema Canada Ltd. established an 18 line-kilometre grid on the AU claims (24) for control of geological mapping, magnetometer and VLF electromagnetic surveys. Cogema also prospected the western part of the Gossan Lake property.

Contwoyto Goldfields Ltd. contracted Covello, Bryan and Associates to complete magnetometer, VLF electromagnetic and HL electromagnetic surveys on a 25 line-kilometre grid on the IF 3 claim and to map and sample the IF 4 claim (25).

Royal Oak Mines Inc. explored the P claims (26) by establishing two grids for geological mapping and by completing 60 line-kilometres of VLF electromagnetic and magnetometer surveys.

Lac de Gras Area

In the Lac de Gras area, Dia Met Minerals Ltd. (49 per cent) and joint venture partner BHP-Utah Mines Ltd. (51 per cent) contracted CF Minerals of Kelowna, British Columbia, to conduct kimberlite indicator mineralogical sampling of till and eskers on claims A, B, C, D, E, F, T, M and W (27). A total of 2 400 heavy-mineral samples were processed by CF Minerals to confirm the presence of kimberlite bodies. Airborne and ground geophysical surveys were also completed. The results confirmed the presence of kimberlite.

In November 1991, the joint venture partners announced the recovery of 81 diamonds, some of gem quality, from a 59 kg sample taken from a 141.7-m long section of kimberlite in a single drillcore. All the diamonds measured less than 2 mm in diameter. BHP-Utah, the operator, planned a winter exploration program to bulk sample 180 t of the kimberlite. The release of this spectacular information resulted in a staking rush. More mining claim tags were sold in Yellowknife in October and November 1991 (1 108) than were sold in the previous nine months. BHP-Utah Mines staked the GO and ED claims comprising 95 110 ha adjoining their other claim holdings in the area.

Monopros Ltd., a Canadian subsidiary of De Beers Consolidated Ltd., also conducted heavy mineral sampling of eskers in the area (27) in a search for kimberlite indicator minerals.

In December 1991, Aber Resources began its purchase of West Viking Exploration and its extensive claim holdings (27) adjacent and to the east of Dia Met Minerals' and BHP-Utah's claims.

Southern Slave Structural Province

Russell Lake-Indin Lake Area

Northwest Gold Corporation completed a winter geophysics and drill program on the Colomac mine lease (d) and on adjacent ground optioned from Petromet Resources Limited and Comaplex Resources International Ltd. This work resulted in the stripping, sampling and drilling of Zone 24 on the ED 1 claim. Additional work included mapping and staking of the NWG 1-6 group, staking of the KNOB 1-2 claims, linecutting on the NWG 2 claim and a VLF electromagnetic survey on the CARON 3 and NWG 2 claims.

Robert Curtis prospected the CURTIS and MARY claims (28) at Wijinnedi Lake and established the presence of iron formation carrying up to 62 parts per billion of gold.

Fortune Minerals Ltd. prospected, sampled and mapped the ROBIN-NATASHA-YELLER-IRON claim group along the Bousso River (29). On the ROBIN claims, chip samples of Lupin-type gold mineralization yielded 7.48 g of gold per t across 2.8 m.

Indian Mountain Lake Area

BHP-Utah Mines Ltd. prospected the COTTONGRASS claims (30) for base metals.

Yellowknife Supracrustal Basin

Cameron-Beaulieu Rivers Belt

Nanisivik Mines Ltd. drilled one hole at Sunrise Lake on the SHEET claim (31) to test for polymetallic sulphide mineralization adjacent to the Sunrise deposit of Aber Resources Ltd. and Hemisphere Development Corp.

NERCO Minerals Inc. mapped and sampled for gold on the VIC claims (32).

Yellowknife Turbidite Basin

An agreement between Athabaska Gold Resources Ltd. and Chrevron Minerals Ltd. allows Athabaska to purchase Chevron's 40 per cent interest in the Nicholas Lake deposit (33). More than 16 000 m of drilling has identified a preliminary reserve of 429 000 t grading 15.78 g of gold per t. An $800 000 exploration program, which started in November 1991, was financed by Royal Oak Mines Inc. The program was designed to test mineralized zones located off the Main Zone. Grids were cut on areas of interest and magnetometer, VLF electromagnetic and induced polarization (IP) surveys were completed. Several drill targets were identified.

Treminco Resources Ltd. continued to explore its TOM and PTARMIGAN gold mine properties (34).

Knut Rasmussen reported that a 1 500-t bulk sample mined in 1990 from the DAF deposit (35), was trucked on the winter (ice) road from Burnt Island to Treminco's Ptarmigan mill for processing. The grade of ore was 19 g of gold per t.

Yellowknife Volcanic Belt

Ger-Mac Exploration Ltd. collared a new portal on the MON property (36) and drifted 70 m to intersect the main vein. The vein was explored by drilling and driving 63 m of drifts and two 10-m long raises. A 550-t ore sample was mined, and Ger-Mac planned to bring a small mill to the site during the winter of 1991-1992 to process the ore. A reserve of 7 000 t with a mineable grade of 13.3 g of gold per t is reported.

On the MARLIN claims (37), Golden Marlin Resources Ltd. and joint venture partner CAMECO drilled five holes totaliing 775 m. Drilling intersected a mineralized structure; however, gold values were low. Golden Marlin also completed a 10-km detailed induced polarization (IP) survey and 540 m of drilling on the HOPE claims, to earn a 50 per cent interest with joint venture partner Rayrock Yellowknife Resources Inc.

Nerco Minerals continued exploration of its mine leases (38). Surface work included mapping and lithogeochemical sampling of the TAN and KEMEX claims and the drilling of three holes totalling 1200 m at Kam Point to test the Campbell Shear. The company completed one 300-m hole at Back Bay on the NKANA claims and two holes for 900 m at Fault Lake on the AYE claims, where another two holes for 700 m were planned before year end. The C16 Shear was explored by 600 m of drilling in six holes.

Royal Oak Mines Inc. conducted prospecting, sampling and line cutting to define drill targets. Targets included a polymetallic sulphide deposit on the G claims (39) at Homer Lake.

Treminco Resources Ltd. and DIW Geological Consultants Ltd. conducted geological mapping, prospecting and sampling on the KAM claims (40).

Bear Structural Province

Aber Resources Ltd. mapped and sampled Proterozoic sediments on the DV claims (41) at DeVries Lake, where copper showings are associated with gold and tungsten. Aber also completed mapping and trenching on the POINT claims (42) in the Balachey Lake area, where gold and copper assays were obtained from previously reported uranium showings.

Cominco Ltd. completed prospecting, mapping and soil sampling to evaluate the base-metal potential of Proterozoic sediments on prospecting permits 1246-1247 in the Robb Lake area (43) and Prospecting Permit 1244 on the Wopmay Lake area (44). Geological, geochemical and geophysical surveys were also conducted on the NOR-SP-A1 group (41) at Norris Lake, to assess the base metal potential of the claims. Additional claim staking of the CU 1-20 group (45) was completed in the Coppermine River area to adjoin the CPR 0-8 claims acquired in 1990.

Noranda Exploration Co. Ltd. conducted geological mapping, prospecting and geochemical surveying on the MAT 1-24 claims (46) to evaluate the copper potential of the Rae Group.

Norman Hennel trenched and sampled rare earth element-bearing volcanics of the Port Radium and Echo Bay Formations on the SCANDIUM claim (47) near Surprise Lake.

Southeast Mackenzie District and the Great Slave Lake Plain

B.P. Resources Canada Ltd. conducted geochemical sampling of claims near the Horn Plateau (48).

Cominco Ltd. conducted gravity and airborne magnetic surveys of claim blocks near Racoon Lake, Mink Lake (49) and Chedabucto Lake (50).

PNC Exploration (Canada) Ltd. conducted electromagnetic surveys and drilled nine holes totalling 1 774 m on the BOOM 1 and 2 claims (51) at Boomerang Lake, near the western edge of the Thelon Basin.

District of Keewatin

Asamera Minerals Inc., in a joint venture with Comaplex Minerals Corp., conducted geological mapping, lithogeochemical sampling, a 4 000 line-kilometre airborne magnetic survey, a VLF electro-magnetic survey and a 1 000 line-kilometre airborne co-axial electromagnetic survey on the NAT claims (52) and adjacent permits in the Meliadine River area, northeast of Rankin Inlet. In the Discovery Zone area (52), 4 540 m of drilling, a ground magnetometer survey and a VLF electromagnetic survey were completed. In the Western Lands project area, west of the Discovery Zone, magnetometer, VLF and horizontal-loop MAXMIN electromagnetic surveys and 730 m of drilling were completed. New claims were staked (NAT 34-41) in this same area. New prospecting permits (PP 1282-1284) east of Peter Lake were explored (53).

Comaplex Minerals Corp. conducted prospecting and mapping on the TAV claims in the Copperneedle River area (54) and on new prospecting permits (PP 1272-1275, 1278, 1279) in the Parker Lake-McQuoid Lake area (55) as well as in the Poorfish Lake Windy Lake area (56) (PP 1276, 1277, 1280, 1281). Follow-up prospecting was conducted on prospecting permits (PP 1233-1237, 1251) in the Montgomery Lake-Otter Lake area (57).

Kaminak Resources Ltd. prospected on a new prospecting permit (PP 1265) and staked new claims at the southeast end of Gibson Lake (53).
On behalf of Lucky Eagle Mines, Agnico Eagle Mines Ltd. and Hecla Mining Company of Canada Ltd., W.A. Hubackeck Consultants Ltd. mapped, conducted magnetometer and UT electromagnetic surveys and drilled 3 990 m in the Meadowbank River area (58) on claims held by Asamera Minerals Inc. and Comaplex Minerals Corp. W.A. Hubacheck Consultants Ltd. also staked eight claims in prospecting permits 1170 and 1171 (59), southwest of Ennadai Lake on behalf of Lucky Eagle Mines.

Noranda Exploration Co. Ltd. conducted reconnaissance exploration in Keewatin District and staked two claims north of Watterson Lake (60).

Norstrat Exploration Inc. staked three claims south of Kinga Lake (61).

Placer Dome Inc., as part of an option agreement with MH Resources Inc. (a consortium of Dejour Mines Ltd., Noble Peak Resources Ltd. and private investors), mapped, prospected and carried out reconnaissance work on the TURQ, JOYCE and SPI claims (61) at Turquetil Lake and on the MAG, PAD and CAR claims (61) in the Heninga Lake to Carr Lake areas.

Placer Dome, as part of an option agreement with Noble Peak Resources Ltd., mapped, prospected and evaluated the MG and MJ claims (62) of the Southwin Project between Kaminak Lake and Quartzite Lake.

Suncor Inc. Resources Group and Comaplex Minerals Corp. conducted geological mapping, trenching, lithogeochemistry, magnetometer and VLF electromagnetic surveys on prospecting permits 1229-1232 and claims in the Hawk Hill-Griffin Lake area (63).

Urangesellschaft (Canada) Ltd. in conjunction with PNC Exploration (Canada) Co. Ltd. and Daewoo Corp., performed VLF electromagnetic, resistivity and magnetometer surveys on leases, claims and prospecting permits in the Judge Sissons Lake-Schultz Lake South area (64). Approximately 10 900 m of drilling were completed on uranium targets. A new prospecting permit (PP 1264) located to the south was prospected, and 23 new claims were staked, namely in prospecting permit areas PP 1161-1163 and 1264.

Arctic Islands

Comaplex Resources International Ltd. and Agnico Eagle Mines Ltd. conducted lithogeochemical surveys in areas underlain by sulphide-bearing schists and rusty iron formation of the Archean Piling Group in Central Baffin Island. Work was concentrated in four prospecting permits near Dewar Lake (65) and eight prospecting permits near Flint Lake (66).

Cominco Ltd. completed 10 holes totalling 2 700 m and induced polarization surveys on eastern Truro Island (67), near its Polaris mine on Little Cornwallis Island. Cominco also conducted airborne VLF electromagnetic surveys on its holdings in the Cornwallis Lead-Zinc District and mapped and surveyed claims on Cornwallis Island (b).

Nanisivik Mines Ltd. drilled in the Oceanview area and DEB claims, northeast and southwest respectively of its Nanisivik mine (c). The company also gridded, surveyed and drilled Mississippi-Valley-type zinc-lead targets in Proterozoic carbonates at Hawker Creek (68) and three areas on prospecting permits near Surprise Creek (69). At Mary River (70) the company drilled six holes totalling 500 m in volcanogenic sulphide targets to test for copper, lead, zinc and precious metals. Gridding, geological mapping and geophysical surveys were conducted on prospecting permits near Eqe Bay and Grant Suttie Bay (71).

Noranda Exploration Co. Ltd., on behalf of joint venture partners Highwood Resources Ltd. and Aber Resources Ltd., conducted airborne magnetometer and electromagnetic surveys, ground geophysical surveys, geological mapping and prospecting on 12 contiguous prospecting permits and claims in Proterozoic sediments near Hadley Bay, northeastern Victoria Island (72). The company drilled 19 holes totalling approximately 2 400 m to test copper-silver prospects in the sediments.

Table 8:
Placer Mining, Mines and Mining Exploration Projects, Yukon, 1991

Location	N.T.S.	Property/CLAIM(S)	Company/Area
1	115 O	Indian River	Placer mining area
2	115N, O	Klondike	Placer mining area
	116 B, C	Klondike	Placer mining area
3	116 B, C	Sixty Mile, Forty Mile Rivers	Placer mining area
4	115 N, O	Lower Stewart River	Placer mining area
5	105 M	Mayo	Placer mining area
6	115 P	Clear Creek	Placer mining area
7	115 I	Dawson Range	Placer mining area
8	105 E	Livingstone Creek	Placer mining area
9	106 D	BLENDE	Billiton Metals; NDU Resources
10	105 L	CLEAR LAKE	Total Energold; Mitsui Kinzoku
11	105 O	TOM	Cominco
12	105 O	NIDD	Cominco
13	105 O	JASON	Phelps Dodge
14	115 I	REVENUE-NUCLEUS	Big Creek Resources
15	105 B	DAN (BAR)	First Yukon Resources
16	105 G	KONA (FYRE LAKE)	Placer Dome
17	106 D	CARPENTER RIDGE	Big Creek Resources
18	115 K	AZ	Noranda
19	105 H	MATT BERRY (BARB)	Pulse Resources
20	116 B	BREWERY CREEK	Loki Gold; Hemlo Gold
21	106 D	SCHEELITE DOME and HAGGART CREEK	Amax Gold
22	115 I	GOULTER	Aurchem
23	105 J	ITSI	Noranda
24	105 F	SEAGULL CK (TAY-LP)	Pacific Comox
25	115 P	JOSEPHINE	Noranda
26	116 A	BEAR	Noranda
27	116 B	LONESTAR	Arbor Resources
a	105 K	FARO AND VANGORDA MINES	Curragh Resources
b	105 A	SA DENA HES MINE	Curragh Resources and Hillsborough Resources
c	105 C	MARLIN	Anooraq Resources
d	105 H	KING ARCTIC JADE	Max Rosequist

Table 9:
Mines and Mining Exploration Properties, Northwest Territories, 1991

Location	N.T.S.	CLAIM(S)/Prospecting Permits (P.P.)/Area	Company
1	77 A	Wombat (Granite) prospect	GSA Management; Gold Corp. Investment
2	76O	BOSTON, KAMIK	BHP-Utah
3	77 M	SANTIAGO AND MADRID	BHP-Utah
4	76 O	HAVANNA	BHP-Utah
5	76 L	ULU, CROWN, DEN-FIDO	BHP-Utah
6	76M	BAMAKO-PARIS, BRAVO	BHP-Utah
7	76 L	HOTEL, SPARK	BHP-Utah
8	76 M	CAIRO AND ROMA, CYGNET	BHP-Utah
9	76 M	HIGH	Kennco Expl.
10	76 M	ARNICA, P.P. 1181	BHP-Utah
11	86 P	P.P. 1285	BHP-Utah
12	76 K	LUI	Cogema
13	76 N	MARC	Cogema
14, 15, 16	76 J	Tinney Hills-Hiukitak River area	Cogema
17	76 K	TAK	BHP-Utah
18	76 G	George Lake area, BRAU	Homestake; Kerr-McGee
19	76 G	Boot Lake area	Homestake; Kerr-McGee
20	76 F,G	PXD-FEG-BEB	Echo Bay
21	76 G	BUCK-NUTS	Echo Bay
22	76 E	COCO	Cominco; Cogema
23	76 E	LST	Cominco
e	76 E	PXD 2, FIN	Echo Bay
24	76 E	AU	Cogema
25	76 E	IF 3, IF 4	Contwoyto Goldfields
26	86 H	P	Royal Oak
27	76 C,D	A,B,C,D,E,F,T,M,W	Dia-Met; BHP-Utah
d	56 B	COLOMAC MINE LEASE, ED1	Northwest Gold
28	85 O	CHARLES, MARY	Robert Curtis
29	85 O	ROBIN-NATASHA YELLER-IRON	Fortune Minerals
30	75 M	COTTONGRASS	BHP-Utah
31	85 I	SHEET	Nanisivik
32	85 I	VIC	Nerco Minerals
33	85 P	Nicholas Lake	Athabaska; Royal Oak
34	85 J	TOM and PTARMIGAN MINES	Treminco Resources
35	85 I	DAF	Knut Rasmussen
36	85 J	MON	Ger-Mac Expl.
37	85 J	MARLIN, HOPE	Golden Marlin Resources
38	85 J	CON MINE LEASE	Nerco Minerals
39	85 J	G	Royal Oak
40	85 J	KAM	Treminco Resources

Table 9: (Continued)
Mines and Mining Exploration Properties, Northwest Territories, 1991

Location	N.T.S.	CLAIM(S)/Prospecting Permits (P.P.)/Area	Company
41	86 C	DV	Aber Resources
41	86 B	NOR-SP-A1	Cominco
42	86 F	POINT	Aber Resources
43	86 F	P.P. 1246-1247	Cominco
44	86 F	P.P. 1244	Cominco
45	86 O	CU 1-20	Cominco
46	86 O,N	MAT 1-24	Noranda
47	86 K	SCANDIUM	Norman Hennel
48	85 K,L	Horn Plateau	B.P. Resources
49	85 K,F	Racoon Lake, Mink Lake	Cominco
50	85 J	Chedabucto Lake	Cominco
51	75 I	BOOM 1,2	PNC Expl.
52	55 J,K,N,O	NAT	Asamera; Comaplex
53	55 N	P.P. 1282-1284	Asamera; Comaplex
53	55 N	P.P. 1265	Kaminak Resources
54	55 K	TAV	Comaplex
55	55 M	P.P. 1272-1275, 1278-1279	Comaplex
56	65 C	P.P. 1276, 1277, 1280, 1281	Comaplex
57	65 G	P.P. 1233-1237, 1251	Comaplex
58	66 H	Meadowbank River	Lucky Eagle; Agnico Eagle; Hecla
59	65 C,D	P.P. 1170, 1171	Lucky Eagle
60	65 G	Watterson Lake	Noranda
61	55,E,L; 65 H,I	TURQ, JOYCE, SPI	Placer Dome
61	55 L; 65 H,I	MAG, PAD, CAR	Placer Dome
61	65 H	Kinga Lake	Norstrat
62	55 L	MG, MJ	Placer Dome
63	65 G	P.P. 1229-1232	Suncor; Comaplex
64	66 A,B	Judge Sissons-Schultz lakes	Urangesellschaft; P.N.C.; Daewoo
65	27 B; 37 A	Dewar Lake	Comaplex; Agnico Eagle
66	37 D	Flint Lake	Comaplex, Agnico Eagle
67	68 H	Truro Island	Cominco
b	68 H	POLARIS MINE	Cominco
c	48 C	Oceanview, DEB	Nanisivik
c	48 C	NANISIVIK MINE	Nanisivik
68	48 A	Hawker Creek	Nanisivik
69	48 A,B	Surprise Creek	Nanisivik
70	37 G	Mary River	Nanisivik
71	37 C	Eqe and Grant Suttie bays	Nanisivik
72	77 G; 86 B	Hadley Bay	Noranda

APPENDIX

The Mining Industry in Canada's Northern Territories

Introduction

The North is that 40 per cent of Canada is occupied by Yukon and the Northwest Territories. It covers an area of 3.86 million square kilometres with dimensions from east to west of 3 500 km and from north to south of 2 500 km.

Mining was established as a founding industrial-age economic activity in the North. It is now the leading industrial sector, accounting for over 30 per cent of the value of goods and services produced in the North. The industry directly employs approximately eight per cent of the employed work force. Mining's linkages to the transportation, electrical, construction and various service sectors are especially significant to the North's economy.

The population of the North in mid-1991 was 82 000 people. During the same year, the value of metals and construction material mined amounted to $890 million or more than $10 000 for every northern inhabitant. Petroleum and natural gas production, during 1991 in the Northwest Territories, accounted for an additional $209 million. A substantial portion of the factor inputs consumed in the production of the hard minerals and metals are either imported from regions south of the 60° latitude or are generated in the North as added value. The added value is derived from such inputs as labour, energy and services. The imported inputs include capital equipment such as shovels and trucks. The value of mineral production also includes the cost of shipping the mineral products or metal to markets and the cost of smelting and refining of mineral concentrates and gold bullion.

Geological Heritage

The landscape of the northern regions is derived from its long and rich geological history. The oldest identified rock in the Northwest Territories lies in the Precambrian Shield. It is 3.962 billion years old, among the oldest rocks of the world. The Precambrian Shield, north of 60° latitude, extends eastward from Great Bear Lake and Great Slave Lake to Hudson Bay and on to Baffin and Ellesmere islands. The igneous, metamorphic and sedimentary rocks of the Shield range in age from more than three billion to less than one billion years. The marine sediments in the youngest of these rocks contain the earliest fossil records of marine life.

The stratigraphic record extends from this late Precambrian era, as represented by Proterozoic sediments, nearly a billion years old, to the Quaternary glacial sediments, some 10 000 to several thousand years old. The sedimentary rock formations and glacial deposits faithfully record their depositional environment. Their fossil record and stratigraphic characteristics are used to correlate rocks across distances of hundreds of miles and to determine the probable age of the sediments.

The last continental ice sheet retreated from the Northwest Territories and Yukon several thousand years ago, leaving an extensive glacial landscape. Post-glacial sediments form modern land forms, such as river deltas. It played a major role in the North's mineral development. Glaciation exposed some of the primary mineral deposits in the shield areas by removing the soil cover. Other mineral deposits are covered by extensive glacial deposits and can only be found by employing geophysical surveys followed by drilling of the geophysical targets.

Recently a diamond-bearing kimberlite pipe was located near Lac de Gras, north of Yellowknife, Northwest Territories, by localizing the source area of the kimberlite rock mineral constituents that had been transported by glaciers during the Pelstocene age and deposited in sand and gravel esker ridges.

Some parts of the North, such as the famous Klondike area, near Dawson, Yukon, were not glaciated during the last ice age. The deep weathering of rocks in the early Tertiary period, 26 to 53 million years ago combined with an uplift of the land area in the late Tertiary, less than 26 million years ago, led to the concentration of rich gold deposits in downcutting streams, within gravel deposits in deep narrow canyons. Beyond the limits of the non-glaciated area in Yukon, glaciation either destroyed or covered many of these gold deposits. Some of the deposits have been found in deep canyons, where the gold-bearing gravels are overlain by glacial sand, gravel and clay deposits that appear higher on the banks of the stream valley.

History of the Earliest Mining

Before European explorers arrived in the North, the indigenous peoples, the Inuit and Indian people, mined and traded native copper derived from the Coppermine and Bathurst Inlet areas of the Northwest Territories and the White River area, Yukon, near the Yukon Alaska border.

In the Northwest Territories, the first European mining took place more than four centuries ago (1577-1578) when Sir Martin Frobisher mined and shipped some 2 000 tonnes of so-called "blacke stone" from the now famous "gold" mine on Kodlunarn Island, on the east side of Frobisher Bay, southern Baffin Island region. The pits were rediscovered 300 years later by C.F. Hall. The worthless barren rock taken to England by Frobisher was believed to contain gold according to the alchemists, but neither the existing pits nor museum samples of the black stone in England contain gold. Nonetheless, Frobisher has the distinction of being the chronicler of the first attempt to mine gold in the North. While in search of China via the Northwest Passage, Frobisher also formed the first northern mining company called, "a Company of Cathay", under charter from Queen-Elizabeth I.

In 1771, Samuel Hearne, a clerk with the Hudson's Bay Company and his remarkable Indian guide, Matonabbee, set out from Churchill on Hudson Bay. It was Hearne's third attempt to locate the legendary mountain of copper in the Coppermine River area. Hearne's party wandered 8 000 km on a year-and-a-half journey, mostly on foot, to find what he described as "no more than an entire jumble of rocks and gravel" at Coppermine Mountain, near the Coppermine River. The copper occurrences and small pieces of native copper float seen by Hearne were of little commercial interest to the Hudson's Bay Company. These showings were later mentioned by a number of explorers who passed through the region and in 1966, the area was the object of a large staking rush and intensive exploration activity. None of the several copper deposits that were outlined during this period were commercially feasible because of the remoteness of the region.

The mineral industry in the North gained a permanent foothold in 1896 when the news of the Klondike gold discovery in Yukon first reached the outside world. The discovery, near Dawson, Yukon, was made by George Carmack, Skookum Jim and Tagish Charlie on Rabbit Creek which was later renamed Bonanza Creek. By the summer of 1898, over 40 000 stampeders had reached the gold field, and by the turn of the century, the Klondike was established as one of the great placer gold fields of the world. Currently, some 194 placer operations with 700 people mine gold on a seasonal basis.

In the Northwest Territories, the mining industry did not become established until 1930 when Gilbert A. LaBine and E. Charles St. Paul staked a cobalt-silver-uranium-bearing vein on McTavish Arm on the east side of Great Bear Lake. This property became the Eldorado mine, which operated as a radium-silver mine between 1933 and 1940, as a uranium mine between 1942 and 1960 and as a silver mine between 1964 and 1982.

The Yellowknife gold camp became firmly established in 1938, when the Consolidated Mining and Smelting Company Ltd. (now Cominco Ltd.) started production at the Con mine. Yellowknife's second gold mine, the Giant mine, entered production in 1948. Except for a period between 1943 and 1946 when the Con mine was closed, both the Con and Giant mines have remained in continuous production since their start.

TABLE 10:
Mineral Production, Yukon,
1982-1991

Mineral		1982	1983	1984	1985	1986	1987	1988	1989	1990(R)	1991(P)
Gold	%	39 721 000	50 337 000	44 419 000	42 669 000	58 237 000	88 970 000	87 386 000	80 070 000	66 731 000	67 097 000
	kg	2 656	3 006	2 960	3 065	3 547	4 674	5 052	5 652	4 639	5 034
Silver	$	29 943 000	6 891 000	18 825 000	13 098 000	18 468 000	40 965 000	42 593 000	14 851 000	15 177 000	12 856 000
	kg	95 000	15 000	54 000	47 000	73 000	133 000	159 000	71 000	84 000	86 000
Lead	$	25 733 000	307 000	1 539 000	848 000	23 893 000	105 982 000	118 696 000	98 ,0 000	124 704 000	81 036 000
	kg	35 493 000	520 000	2 083 000	1 470 000	35 091 000	100 267 000	117 058 000	94 529 000	104 181 000	95 224 000
Copper	$	14 654 000	3 977 000		19 000	13 000	22 000				
	kg	7 510 000	1 904 000		10 000	6 000	9 000				
Zinc	$	58 519 000	31 000	244 000	137 000	61 521 000	187 336 000	237 932 000	332 934 000	325 366 000	178 340 000
	kg	54 537 000	27 000	173 000	109 000	50 634 000	147 045 000	143 939 000	154 709 000	168 846 000	142 558 000
Antimony	$								11 000	3 000	4 000
	kg								4 000	1 000	2 000
Bismuth	$			2 000	11 000	5 000	2 000	2 000	12 000		
	kg			162	1 000	541			1 000		
Cadmium	$		6 000	9 000	5 000	8 000	13 000	62 000	8 000		
	kg		2 000	2 000	1 000	2 000	2 000	3 000	1 000		
Sand and Gravel	$	550 000	1 438 000	5 105 000	2 995 000	13 355 000	1 502 000	5 184 000	5 675 000	9 833 000	6 883 000
	t	463 000	480 000	3 074 000	1 185 000	4 902 000	352 000	2 246 000	2 367 000	2 113 000	1 542 000
Sulphur	$				267 000	1 000	156 000	183 000	39 000		
(smelter gas)	t				2 000	7	1 000	2 000	N/A		
Coal (E)	$	368 000				209 000	440 000	100 000	420 000		
	t	20 860				17 223	20 000	10 000	40 000		
Stone	$						679 000				
	t						206 000				
TOTAL	$	169 120 000	62 987 000	70 143 000	60 069 000	176 310 000	426 027 000	492 299 000	532 330 000	541 814 000	346 216 000

Source: Mineral Policy Sector, Energy, Mines and Resources Canada and Natural Resources and Economic Development, Indian Affairs and Northern Development.
(P) Preliminary figures, (R) Revised figures, (E) Estimated, (X) Confidential, (N/A) Not available

TABLE 11:
Mineral Production, Northwest Territories, 1982-1991

Mineral		1982	1983	1984	1985	1986	1987	1988	1989	1990(R)	1991(P)
Gold	$	91 415 000	144 570 000	191 071 000	177 079 000	205 266 000	223 456 000	205 503 000	177 260 000	223 788 000	220 742 000
	kg	6 113	8 634	12 732	12 713	12 503	11 740	11 880	12 208	15 557	16 562
Silver	$	16 073 000	33 743 000	20 361 000	9 083 000	5 478 000	4 006 000	6 923 000	3 820 000	3 457 000	2 876 000
	kg	51 000	74 000	59 000	33 000	22 000	13 000	26 000	18 000	19 000	19 000
Copper	$	419 000	214 000	130 000	46 000	1 000	4 000	3 000			
	kg	215 000	102 000	69 000	23 000	1 000	2 000	1 000			
Lead	$	46 367 000	47 981 000	66 647 000	44 489 000	91 129 000	139 370 000	52 223 000	41 323 000	55 766 000	26 724 000
	kg	63 955 000	81 161 000	90 198 000	77 083 000	133 836 000	131 744 000	51 502 000	39 734 000	46 588 000	31 403 000
Zinc	$	229 110 000	269 951 000	386 813 000	356 415 000	322 064 000	328 781 000	537 756 000	708 009 000	420 550 000	270 002 000
	kg	213 523 000	234 883 000	274 920 000	284 223 000	265 073 000	258 070 000	325 321 000	329 001 000	218 241 000	223 024 000
Cadmium	$		10 000	1 034 000	866 000	670 000	501 000	3 172 000	4 405 000	266 000	
	kg		3 000	214 000	238 000	175 000	86 000	166 000	269 000	31 000	
Bismuth	$		163 000	34 000	60 000						
	kg		32 000	3 000	3 000						
Antimony	$						141 000	55 000	43 000	6 000	
	kg						44 000	19 000	18 000	3 000	
Tungsten	$	38 353 000	11 221 000	33 584 000	38 918 000	17 363 000					
Trioxide (E)	kg	2 925 000	1 126 000	3 112 000	3 529 000	2 470 000					
Arsenious	$	3 862 000	2 345 000	5 837 000	1 969 000	254 000	666 000	2 366 000	1 286 000	240 000	247 000
Trioxide (E)	t	1 780	982	4 684	4 098	406	X	X	X	X	X
Sulphur	$				11 665 000	21 788 000	6 912 000	7 286 000	8 468 000	2 677 000	3 195 000
(smelter gas)	t			98 000	147 000	59 000	6 000	73 000	67 000	17 000	20 000
Sand and Gravel	$	41 482 000	32 479 000	36 323 000	8 981 000	3 281 000	8 132 000	10 966 000	11 813 000	13 856 000	8 160 000
	t	6 625 000	5 905 000	7 249 000	6 803 000	986 000	2 183 000	2 443 000	2 203 000	3 274 000	1 853 000
Stone	$	1 268 000	14 601 000	4 617 000	434 000	1 011 000	1 486 000	232 000	4 344 000	9 079 000	3 735 000
	t	323 000	2 409 000	729 000	163 000	368 000	472 000	108 000	727 000	1 495 000	508 000
TOTAL	$	468 349 000	557 198 000	746 451 000	649 732 000	668 452 000	713 310 000	826 487 000	960 771 000	729 675 000	544 681 000

Source: Mineral Policy Sector, Energy, Mines and Resources Canada and Natural Resources and Economic Development, Indian Affairs and Northern Development.
(P) Preliminary figures, (R) Revised figures, (E) Estimated, (X) Confidential